

CLAIMS

1. A cathode arc source for generating positive carbon ions from a cathode target, said ions being emitted in a direction substantially normal to a front surface of the target, comprising:-

- a cathode;
- an anode;
- a vacuum chamber; and

means for generating a magnetic field in the chamber, wherein the magnetic field has direction substantially normal to the front surface of the target and zero field strength at a position above the target and inside the chamber, the magnetic field being the resultant of fields generated by a first field generating means located above the target and a second field generating means located below the target.

2. A source according to Claim 1 wherein an inner surface of the chamber is an anode.

3. A source according to Claim 2 comprising means for generating a first magnetic field proximal to the target and having a first field direction and means for generating a second magnetic field distal from the target and having a field direction substantially opposite to that of the first.

4. A source according to Claim 2 for generating positive ions from a graphite target comprising means for generating a magnetic field wherein:

- (1) at a front surface of the target, field direction substantially normal to the front surface is towards the front surface;
- (2) magnetic field strength in said direction decreases with increasing distance from the target to a point of zero field strength substantially

normal to the front surface; and

- (3) from said point of zero field strength, with increasing distance from the target, field direction is away from the front surface of the target.

5. A source according to Claims 2 for generating positive ions from a graphite target comprising means for generating a magnetic field wherein:

- (1) at a front surface of the target, field direction substantially normal to the front surface is away from the front surface and towards the substrate;
- (2) magnetic field strength in said direction decreases with increasing distance from the target to a point of zero field strength substantially normal to the front surface; and
- (3) from said point of zero field strength, with increasing distance from the target, field direction is towards the front surface of the target.

6. A source according to Claim 2 comprising means for generating a magnetic field which has zero field strength in a direction substantially normal to the target and a lateral field strength of 15mT to 35mT.

7. A source according to Claim 2 in which at the point of zero field strength in a direction substantially normal to the target, field strength in a direction substantially lateral to the target is at least 10mT.

8. A source according to Claim 7 wherein the point of zero normal magnetic field is located between 2 and 6 cm above the surface of the target.

9. A source according to Claim 1 further comprising means for generating a radial electric field to focus positive ions generated from the source into a beam.

10. A cathode arc source comprising:-

a cathode;

an anode;

a vacuum chamber;

means for generating a magnetic field in the vacuum chamber;

a cathode station for location of a target in electrical contact with the cathode, said target having a front and a rear surface; and

means for striking an arc at the front surface of the target;

wherein the magnetic field generating means is for generating a magnetic field at the front surface of the target and wherein the magnetic field has a lateral field component effective to maintain the arc on the front surface of the target during operation.

11. A method of striking an arc at a graphite cathode target in a vacuum chamber comprising:-

(i) generating (a) below the target, a first magnetic field having a first field direction and (b) above the target, a second magnetic field having a second field direction opposite to that of the first, so as to generate a magnetic field that is resultant from the first and second fields; and

(ii) striking the arc in the resultant field.

12. A method according to Claim 11 wherein the arc is struck between a cathode and an anode formed by an inner surface of the vacuum chamber.

13. A method according to Claim 11 comprising varying coil current in means

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for generating the first or second magnetic fields so as to vary the resultant field to optimize arc striking.

14. A method according to Claims 11 comprising using the first magnetic field to steer plasma from the arc through a macroparticle filter.

15. A method according to any of Claims 11 wherein the first and second fields are substantially co-axial.

16. A method according to Claim 15 wherein the first and second fields are substantially co-axial with plasma emitted from the arc.

17. A target for use in a cathode arc source comprising graphite powder of average size greater than 2 microns pressed under elevated temperature and pressure.

18. A target according to Claim 17, pressed in the substantial absence of binding material such as tar or bitumen.

19. A target according to Claim 17, having a density of 1.7 - 2.0 g/cm³.

20. A target according to Claim 19, having a density of 1.8 - 1.95 g/cm³.

21. A target according to Claim 17 obtainable by pressing graphite powder of particle size 2-20 microns at a temperature of at least 150°C and a pressure of at least 400 MPa.

22. A method of making a graphite target for use in a cathode arc source, comprising pressing graphite powder, in the absence of binding material such as tar or bitumen, at a pressure of 450-620 MPa and a temperature of 130 - 330°C to form a solid target.

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23. A method according to Claim 22 comprising pressing the graphite powder at a pressure of 520-600 MPa.

24. A method according to Claim 23 comprising pressing the graphite powder at a pressure of about 550 MPa.

25. A method according to Claim 22 comprising pre-heating the graphite powder in an oven at 100 - 400°C.